What is claimed is:

1. A power supply apparatus, comprising:

a power conversion circuit converting an input voltage from an input power supply into a predetermined voltage;

an input fluctuation control circuit connected to said power conversion circuit, suppressing fluctuation of said input voltage;

an LC filter smoothing an output of said power conversion circuit and supplying the smoothed output of said power conversion circuit to a load; and

a control circuit controlling said power conversion circuit based on an output voltage of said LC filter, and

wherein an open-loop transfer function calculated by a transfer function of said power conversion circuit, a transfer function of said LC filter and said load, and a transfer function of said control circuit realizes a frequency characteristic having a phase trap.

2. The power supply apparatus as set forth in claim 1, wherein said input fluctuation control circuit controls said output of said power conversion circuit so as to be constant in multiplying voltage by time.

3. The power supply apparatus as set forth in claim 1, wherein said frequency characteristic having said phase trap is a frequency characteristic without a gain margin.

4. The power supply apparatus as set forth in claim 1, wherein said frequency characteristic having said phase trap is a frequency characteristic having only a phase margin among a gain margin and said phase margin.

5. The power supply apparatus as set forth in claim 1, wherein said frequency characteristic having said phase trap is a frequency characteristic in which a gain exceeds 0 dB at a frequency at which a phase becomes -180 degrees.

6. The power supply apparatus as set forth in claim 5, wherein said frequency at which said phase becomes -180 degrees is set within a frequency range from a resonant frequency of said LC filter to a gain crossover frequency.

7. The power supply apparatus as set forth in claim 1, wherein said frequency characteristic having said phase trap is a frequency characteristic in which a gain exceeds 0 dB at a frequency at which a phase is most delayed.

8. The power supply apparatus as set forth in claim 7, wherein said frequency at which said phase is most delay is set within a frequency range from a resonant frequency of said LC filter to a gain crossover frequency.

9. The power supply apparatus as set forth in claim 1, wherein said input fluctuation control circuit comprises:

a circuit generating a first signal whose inclination varies in accordance with said input voltage;

a circuit comparing said first signal with a second signal from said control circuit, and outputting a third signal if a voltage of said first signal becomes an voltage of said second signal or more; and

a circuit generating a driving signal that is turned ON in response to a clock signal and is turned OFF in response to said third signal.

10. An power supply apparatus, comprising:

a power conversion circuit converting an input voltage from an input power supply into a predetermined voltage;

an input fluctuation control circuit connected to said power conversion circuit, suppressing fluctuation of said input voltage;

an LC filter smoothing an output of said power conversion circuit and supplying the smoothed output of said power conversion circuit to a load; and

a control circuit controlling said power conversion circuit based on an output voltage of said LC filter, and

wherein said control circuit has a PID control function, and an integral control element is applied at frequencies higher than a resonant frequency of said LC filter.

11. The power supply apparatus as set forth in claim 10, wherein said control circuit is a circuit in which a differential control element is applied at frequencies lower than a gain crossover frequency.